

Remarks/Arguments

In response to the Office Action of October 6, 2003, the following amendments and arguments are made per the enumerated paragraphs. Claims 1-13 remain pending in this application.

At page 2, Claim 4 was objected to for reason of an informality, i.e., a typographical error. An amendment has been made which overcomes the basis for the rejection.

Rejection of Claims 1, 5 and 8 under 35 U.S.C. §102(b) over Mitchell, et al US 3,655,344

A. Examiner's Rejection

The Examiner cited Mitchell, et al for disclosing that methods have been proposed whereby titanium tetrachloride can be obtained from a chlorination product mixture by treatment with various chemical agents followed by rectification. Such chemical agents include sulfur, rubber, chlorinated hydrocarbons, various organic compounds and particularly oils of mineral, animal, and vegetable origin, soaps, metals, either alone or in combination, with alkaline agents, powdered ion, metal hydrides, etc. The Examiner concluded from this disclosure at col. 2, lines 23-37, that since metal hydrides were disclosed that was sufficient for a 102 rejection.

B. Argument

Reconsideration of the rejection of Claims 1, 5 and 8 is requested. Claims 1, 5, and 8 are directed to removing trace levels (emphasis added) of Group IVb and Vb metals from a Group IVb tetrahalide, e.g., titanium tetrachloride, trace levels typically being about 500 ppb and less in commercial products such as commercial titanium tetrachloride (see page 1, paragraph 3. The preamble of the Jepson claim format is

directed to an essentially already purified metal tetrahalide, but because of the trace levels of impurities, it not suited for ultra-high purity applications. Applicants' process as claimed addresses this problem resulting in an ultra high purity product. On the other hand, at col. 2, lines 22-35, Mitchell, et al disclose an interim step in the production of titanium tetrachloride, i.e., treating crude titanium tetrachloride (emphasis added) with a variety of chemical treating agents. On treatment with the chemical treating agent, a solid phase is generated and the solid phase sent to sludge storage. They continue at line 33 and disclose that following chemical treatment the liquid phase, generated after separation, is vaporized and the condensate sent to a rectification zone where water white titanium chloride is produced.

As a first point, then, Applicants claims are directed to removing trace levels of the IVb and Vb contaminants from what could be considered a purified feedstock, e.g., a commercial titanium tetrachloride product. Mitchell, et al treats a crude titanium tetrachloride reaction product leading to a water white product, i.e., a product which Applicants' claims is their feedstock. These feedstocks contain high levels of metals as well as other contaminants, not trace levels. Through treatment and rectification a water white product is produced by Mitchell, et al. But, a water white, commercial titanium tetrachloride as exemplified by Mitchell, et al does not mean that the titanium tetrachloride product does not contain trace contaminants of metals therein. Mitchell, et al produce a product containing trace levels of metal contaminates and do not disclose a process for reducing such levels from their final product. (An excerpt is attached to this response regarding titanium tetrachloride specification by Dupont noting that titanium tetrachloride is colorless (water white) but it has trace levels of various metal contaminants retained therein.) It is these kinds of feedstocks which have trace levels of metal contaminants that are the subject of Applicants' claims. And, it is these feedstocks

which must be reduced in metal content to meet the objectives of Applicants' claims in producing metal and titanium tetrahalides suited for applications such as in the manufacture of integrated circuits. The chemical treatment of crude titanium tetrachloride by Mitchell is directed to an entirely different feed stock and thus obviates a rejection under 35 U.S.C. §102(b) for that reason alone.

As a second point, Applicants add a Group IVb metal hydride to the feedstock containing trace levels of Group IVb and Vb metal contaminants. Mitchell, et al offers no suggestion as to the addition of this element of the claims to their crude feedstock. Mitchell, et al disclose the addition of metal hydrides as a possibility but nothing more.

As a third point, Mitchell, et al point out that the chemical treatment agents work in different ways. A wide variety of agents are described. However, Applicants' Claims 1, 5, and 8 require that after treatment with a Group IVb metal hydride, the Group IVb metal tetrahalide is separated from the thus formed lower volatile compound by distillation, sublimation or combination. Although Mitchell, et al disclose rectification after treatment of the crude reaction product with a chemical treatment agent, there is no indication that any or all of the chemical agents used for treating the crude reaction product result in producing compounds of lower volatility are separated from the desired metal tetrahalide via distillation or sublimation. Given the wide disparity of chemical treatment agents it is hard to conceive that all would perform in the same manner to allow for essentially complete reduction of the trace levels of metal contaminants.

In summary, a rejection under 35 U.S.C. §102(b) based upon Mitchell '344 is not supportable because the Mitchell reference does not place the subject matter claimed by Applicant in the possession of the public. To have an anticipation, the invention claimed must have been described, and Mitchell, et al does not disclose Applicants' process of

adding a group IVb metal halide to a feedstock having trace levels of metal
contaminates.

Rejection of Claims 1-13 Under 35 U.S.C. §103(a) over Mitchell '344

A. Examiners Rejection

The gist of the rejection of Claims 1-13 based upon Mitchell, et al '344 is that it would have been obvious to select any combination among the specifically disclosed compounds and optimize the process to obtain the best results. The selection of titanium hydride was deemed to have been obvious because it would not introduce a foreign material into the process. (presumably this rejection was directed specifically to Claims 8 -13.)

B. Argument

Reconsideration of the rejection under 35 U.S.C. §103(a) is requested in light of the amendments to Claims 1 and 8.

As stated in reference to the rejection under 35 U.S.C. §102(b) the feedstock employed by Applicants, and appropriately defined by the Jepson format of the claims, is one that contains trace levels of Group IVb and Vb metals, found in commercial grade feedstocks, e.g., up to 500 ppm (0.05% contaminant level). Mitchell, et al is directed to treating crude titanium tetrachloride feedstocks having from 0.1 to 0.25% vanadium not to mention the other contaminating metals present in the chlorination reaction product, e.g. ore and carbonaceous reductant (col. 2, lines 9-15). Mitchell, et al, point out that level of vanadium is responsible for the yellowish color (col. 2, lines 5-8). Mitchell, et al

remove the vanadium to levels which result in a water white product. But, there is no teaching in Mitchell, et al that would have suggested the removal of the remaining trace levels of metal contaminants, and particularly the Group IVb and Vb metal contaminants therein, by addition of Group IVb metal hydrides, particularly in the amount set forth in Claims 7 and 13. There is no teaching of reducing contaminants to the levels taught by Applicants, as for example set forth in Claim 6.

Mitchell, et al teach the use of components such as sulfur, hydrogen sulfide chlorinated hydrocarbons, etc., as a means of treating crude titanium tetrachloride and then separating into a liquid and solid phase. A portion of the titanium tetrachloride is removed to sludge storage and the liquid phase also containing titanium tetrachloride is sent to a vaporization zone. The use of metal hydrides as a chemical treatment agent prior to solid/liquid separation is optional in the Mitchell, et al process and it is used in combination with other components, e.g., iron powder, rubber, chlorinated hydrocarbons, etc. such elements being eliminated by the use of Applicants use of "consisting essentially of" language in Claims 1 and 8.

Another major problem with Mitchell '344 in the analysis under 35 U.S.C. §103(a) is that the selection of the use of a metal hydride is happenstance and yet, it is the selection of specific metal hydrides, i.e., Group IVb metal hydrides as set forth in Claims 1-7 and titanium hydride as set forth in Claims 8-13 that is essential in Applicants' claimed process. Applicants' claims require conversion of the trace Group IVb and Vb metal contaminants with the Group IVb metal hydride to compounds of lower volatility and then separating by distillation, sublimation or combination. The process steps and sequence are not taught nor suggested in Mitchell.

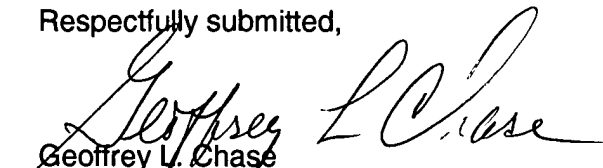
What is clear from the rejection is that the Examiner has confused the issue of obviousness with that of inherency. In other words, the rejection based upon obviousness is based upon the logic that it would have been obvious to employ a metal hydride alone to treat the product of Mitchell, et al and the result would have been inherent. That, is not the law with respect to 35 U.S.C. §103(a). (see *In re Naylor*, 152 U.S.P.Q, 106, (1966).) As stated supra, there is no commonality among the chemical treatment agents disclosed in Mitchell, et al and the selection of the metal hydride out of this list would not have been obvious, and therefore, have led to Applicants' process as defined by the claims. There is no motivation in Mitchell, et al that suggests a solution to the problem addressed by Applicants' claims.

In summary, Mitchell is directed to treating the chlorination reaction product in the production of titanium tetrachloride to produce water white titanium chloride. The processing procedures of Mitchell, et al are altogether different than are the Applicants' procedures necessary for removing the trace metal contaminants that remain in the product after rectification, e.g., the Mitchell, et al rectification step 15 leading to TiCl₄ product in line 46. There is no teaching in Mitchell, et al that suggests a mechanism for removing trace metal contaminants remaining in the product at that point in the process, including the use of reactant consisting essentially of a Group IVb metal hydride followed by additional rectification.

In view of the foregoing, it is requested the claims be reconsidered in light of the amendments and arguments made herein and the application passed to issue.

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Respectfully submitted,


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